

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

UNITED STATES OF AMERICA)	
)	
v.)	CRIMINAL NO. 13-10200-GAO
)	FILED UNDER SEAL
DZHOKHAR TSARNAEV)	

**MOTION TO EXCLUDE TOOLMARK IDENTIFICATION EVIDENCE AND
REQUEST FOR DAUBERT HEARING**

Defendant, Dzhokhar Tsarnaev, by and through counsel, respectfully moves, pursuant to Federal Rules of Evidence 104(a), 402, 403, 702, 703, and the Fifth and Sixth Amendments to the United States Constitution, to exclude the government's proposed expert testimony regarding toolmark identification from trial. Defendant submits that, at a minimum, the Court must schedule a *Daubert* Hearing to determine the admissibility of the proposed testimony.

As grounds therefore, defendant states: (1) there is no reliable scientific basis for this proposed testimony, and thus the testimony is inadmissible under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999); (2) the testimony is inadmissible under the 2000 amendments to Rule 702 in that (a) the testimony is not based upon sufficient facts or data, and (b) the testimony is not the product of reliable principles and methods; (3) the subjective conclusion, unsupported by statistical analysis, that a particular item is linked to a particular weapon or tool is so weak as to lack any probative value; and (4) any weak probative value of the proposed testimony is also substantially outweighed by the danger

of unfair prejudice, confusion of the issues, and misleading the jury, and by considerations of undue delay, waste of time, and needless presentation of cumulative evidence and is thus inadmissible under F.R. Evid. 403. Defendant submits that, at a minimum, a voir dire hearing is required to determine the admissibility of the testimony.

FACTS

This government's September 2, 2014 notices the expert testimony of Massachusetts State Police Lieutenant David Cahill, a firearms toolmark examiner to testify as follows:

Lieutenant Cahill will testify that the Ruger P95 semi-automatic pistol identified in MSP Case No. 13-08140 as Item No. 4-1 ("the Ruger") fired the following items: (a) the cartridge casings and projectiles identified in MSP Case No. 13-08140 as Item Nos. 4-54 through 4-78, 4-80 through 4-111, 4-122, 4-125, 5-80, 5-81, 6-2, 61-3, and 61-5; and (b) the cartridge casings and projectiles identified in MSP Case No. 13-08091 as Item Nos. 7-6 through 7-15. It is also his opinion that the projectiles identified in MSP Case No. 13-08140 as Item Nos. 61-1, 61-3, and 61-5 have the same class characteristics as the Ruger.

Gov't Letter of September 2, 2014 at 2. The government's position appears to be that Trooper Cahill should be permitted to identify the Ruger as having fired cartridges and projectiles found at the scene of the shooting of MIT Police Officer Sean Collier and at the Laurel/Dexter scene, where hundreds of rounds were fired by law enforcement, merely on the say-so of the examiner who, using a methodology with no empirical support or statistical analysis, is willing to state that he can exclude all other weapons in the world as the source. As to three of the projectiles, the government seeks to permit the trooper to testify that some Ruger in the world could have fired them.

Additionally, the government provided notice that FBI Laboratory Physical Scientist Erich Smith will testify:

that the marks left by a wire-cutter seized at 410 Norfolk St. were found on insulated wires seized at the Watertown crime scene that were part of the toggle-switch triggering assembly of the pressure cooker IED that exploded there.

Id. As with Trooper Cahill, the government's proffers Smith's testimony identifying a pair of wire-cutters, to the exclusion of all other tools in the world, on the say-so of the examiner. Both Cahill's and Smith's testimony fail to meet the standards of *Daubert v. Merrell Dow Pharmaceutical*, 509 U.S. 579 (1993) and the Federal Rules of Evidence and must therefore be excluded.

ARGUMENT

I. THE DISTRICT COURT'S GATEKEEPING RESPONSIBILITY

"Testimony emanating from the depth and scope of specialized knowledge is very impressive to a jury. The same testimony from another source can have less effect." *Ake v. Oklahoma*, 470 U.S. 68, 82 n.7 (1985) (citation omitted). Consequently, when a party moves to introduce scientific, technical, or specialized expertise this Court is obligated, under Federal Rules of Evidence 104(a) and 702, to act as a "gatekeeper" to ensure the evidence "is not only relevant, but *reliable*." *Daubert v. Merrell Dow Pharmaceutical*, 509 U.S. 579, 589 (1993) (emphasis added); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 141 (1999) (expanding *Daubert's* holding to expertise deemed "technical" or "specialized knowledge" under Rule 702); *General Electric Co. v. Joiner*, 522 U.S. 137,

142 (1997). In order to faithfully carry out its gatekeeping responsibility, this Court must adhere to the principles articulated in *Daubert*, *Kumho Tire*, and *Joiner*.

In *Daubert*, the Supreme Court articulated the legal framework for how non-science federal judges are to distinguish between reliable science and “science that is junky.” *Kuhmo Tire*, 526 U.S. at 159 (Scalia, J., concurring). This framework entails considering five non-exhaustive factors. The first is whether the forensic “theory or technique... can be (and has been tested),” *Daubert*, 509 U.S. at 593. Second is “whether the theory or technique has been subjected to peer review and publication.” *Id.* The third factor is whether the technique has a “known or potential rate of error.” *Id.* at 594. Fourth is whether there exist any “standards controlling the technique’s operation.” *Id.* The fifth is whether the technique is “generally accepted” by the scientific community. *Id.* These factors assist district courts in determining “whether the reasoning or methodology underlying the testimony is... valid and of whether that reasoning or methodology properly can be applied to the facts in issue.” *Id.* at 592-593.

Rule 702 further requires that the evidence or testimony “assist the trier of fact to understand the evidence or to determine a fact in issue.” Fed. R. Evid. 702. “[A] proposed expert witness must be sufficiently qualified to assist the trier of fact, and . . . his or her expert testimony must be relevant to the task at hand and rest on a reliable basis.” *United States v. Diaz*, 300 F.3d 66, 73 (1st Cir. 2002); see *United States v. Monteiro*, 407 F.Supp.2d 351, 356-58 (D.Mass 2006)(proper gatekeeper role after *Daubert* requires vigilance in ensuring a rigorous examination of the facts on which the expert relies, the

method by which the expert draws an opinion from those facts, and how the expert applies the facts and methods to the case at hand).

The key principles of *Daubert* are incorporated in Rule 702, which permits expert testimony only if:

- (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.

Fed. R. Evid. 702. Pursuant to Rule 702 and *Daubert*, “[r]eliability questions may concern the expert's data, method, or his application of the method to the data....The party offering the expert must show that the method employed by the expert ... is scientifically sound and that the opinion is based on facts which satisfy Rule 702's reliability requirements [A]ny step that renders the expert's analysis unreliable . . . renders the expert's testimony inadmissible. This is true whether the step completely changes a reliable methodology or merely misapplies that methodology.” *United States v. Nacchio*, 555 F. 3d 1234, 1241 (10th Cir. 2009)(*en banc*) (internal quotations and citations omitted).

In the toolmarks context, two sessions of this court have concluded that the trial judge's gatekeeper role requires a searching inquiry into the “science” underlying toolmarks opinions because of the highly subjective nature of the identification it entails.

Monteiro, supra, 407 F.Supp.2d at 356-58; *United States v. Green*, 405 F.Supp.2d 104, 117 -118 (D.Mass. 2005)(the unwarranted “patina” of scientific evidence that juries may attach are especially present where firearm was to be identified as “the one” “to the exclusion of all other weapons in the world”). Faith to the gatekeeping responsibilities is particular critical when determining whether toolmarks testimony is admissible. *See, e.g., United States v. Glynn*, 578 F.Supp.2d 567, 574 (S.D.N.Y. 2008) (“[B]allistics examination not only lacks the rigor of science but suffers from greater uncertainty than many other kinds of forensic evidence.”); *United States v. Taylor*, 663 F.Supp.2d at 1179 (“[W]hile there is a method underlying firearms identification evidence, and while that method has long been accepted both by the forensic science community and by courts, several significant criticisms have been levied against the field. These criticisms are serious enough that Mr. Nichols himself has felt compelled to defend his craft in writing. They are also serious enough that courts have increasingly paid attention to them.”); *Ramirez v. State*, 810 So.2d 836, 853 (Fla. 2001) (excluding toolmarks evidence, commenting on the “rising national criticism of forensic evidence” and mandating that trial judges “must... cull scientific fiction and junk science from fact.”).¹ The burden, of

¹ The “rising national criticism of forensic evidence” is due in large part to the increasing number of wrongful convictions which can be attributed to erroneous or fraudulent forensic evidence. *See Melendez-Diaz v. Massachusetts*, 557 U.S. 305, 317 (2009)(“Serious deficiencies have been found in the forensic evidence used in criminal trials. One commentator asserts that ‘[t]he legal community now concedes, with varying degrees of urgency, that our system produces erroneous convictions based on discredited forensics.’.... One study of cases in which exonerating evidence resulted in the overturning of criminal convictions concluded that invalid forensic testimony contributed to the convictions in 60% of

course, is on the government to demonstrate that the proposed testimony passes muster under both *Daubert* and Rule 702. *See Monteiro, supra*, 407 F.Supp.2d at 356 (“The proponent of expert testimony bears the burden of showing that its proffered expert’s testimony is admissible.”); *Daubert*, 509 U.S. at 592 n.10 (the burden of proof is set by Rule 104(a) and requires that the proponent of the evidence show by a preponderance of the proof that the basis for the proffered expert opinion is reliable)(citing *Bourjaily v. United States*, 483 U.S. 171, 175-176 (1987)).

the cases.”)(citing Metzger, *Cheating the Constitution*, 59 Vand. L.Rev. 475, 491 (2006) and Garrett & Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L.Rev. 1, 14 (2009) See also, Michael J. Saks & Jonathan J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 Sci. 892 (Aug. 2005) (reporting that forensic testing errors were responsible for wrongful convictions in 63% of the 86 DNA exoneration cases reported by the Innocence Project); Craig Cooley, *Forensic Science and Capital Punishment Reform: an "Intellectually Honest" Assessment*, 17 Geo. Mason U. Civ. Rts. L.J. 299, 386 (2007)(documenting numerous cases of forensic fraud); Craig M. Cooley, *Reforming the Forensic Science Community to Avert the Ultimate Injustice*, 15 Stan L. & Pol’y Rev. 381, 395-397, 435-440 (2004) (listing and discussing capital and non-capital wrongful convictions attributable to forensic evidence). As Judge Gertner commented in a firearm identification case:

Indeed, recent reexaminations of relatively established forensic testimony have produced striking results. Saks and Koehler, for example, report that forensic testing errors were responsible for wrongful convictions in 63% of the 86 DNA exoneration cases reported by the Innocence Project at Cardozo Law School.

Green, supra, 405 F.Supp.2d at 109 n.6 (citing Saks & Koehler, *supra*). *See also United States v. Bentham*, 414 F.Supp.2d 472 (S.D.N.Y. 2006)(“False positives - that is, inaccurate incriminating test results-are endemic to much of what passes for ‘forensic science.’”)(citing Saks & Koehler, *supra*). As a State Supreme Court Justice has commented, “There are numerous examples [of forensic fraud] in the literature.” *State v. Clifford*, 121 P.3d 489, 503 n.4 (Mont. 2005) (Nelson, J., concurring) (referring to Fred Zain, Ralph Erdman, and Arnold Melnikoff).

Thus, before the testimony may be admitted, the Government must put forth evidence demonstrating that its firearm and toolmarks examiners can accurately link a bullet or cartridge casing, or a stripped wire, to the *one and only firearm or tool* which could have created the mark. Richard A. Grybowski & John E. Murdock, *Firearm and Toolmark Identification—Meeting the Daubert Challenge*, 30 *Ass’n Firearms & Tool Mark Examiners J.* 3, 6-7 (1998) (discussing the premises which support toolmark identification). This it cannot do. As shown below, the infirmities of toolmark identification testimony that have been identified by district court judges, including Judges Saris and Gertner in *Monteiro* and *Green*, are glaring, manifest, and persistent. The report by the National Academy of Sciences National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (hereinafter “NRC (2009)”, has further undercut the pillars of toolmarks identification and the judicial qualms about admitting such testimony at trial should be even more acute. Defendant submits that this Court should exclude the proposed testimony; at a minimum, it must hold a *Daubert* hearing to determine whether the testimony may be admitted consistent with Fed. R. Evid. 702.

II. A TOOLMARK AND FIREARMS IDENTIFICATION PRIMER

Once a firearm examiner has determined which type of tool could have produced the bullet or shell casing toolmarks, he or she is then confronted with the more daunting task of individualizing the toolmarks to a suspected weapon. This task is complicated because individualizing a toolmark to the one and only tool requires the ability to

distinguish between three types of toolmark characteristics: (a) class characteristics; (b) subclass characteristics; and (c) individual characteristics. *See* John I. Thornton & Joseph L. Peterson, *The General Assumptions and Rational of Forensic Identification, in Science in the Law: Forensic Science Issues 19* (David L. Faigman et al. eds. 2002) 5-7.

Class characteristics are universal characteristics which separate a group of objects from a cosmos of miscellaneous objects (e.g., separating the different types of Halloween candy - M&Ms go in the M&M pile, gumballs go into the gumball pile). *See Monteiro*, 407 F.Supp.2d at 360 (“Class characteristics are defined as ‘family resemblances which will be present in all weapons of the same make and model.’”) (citation omitted). Class characteristics provide the very practical function of inspecting a sizeable quantity of items by purging from consideration those items which do not share the characteristics common to all of the members of that group. Individuality, however, cannot be established with class characteristics, as it can only be established with “those exceptional characteristics that may establish the uniqueness of the object.” *Thornton & Peterson, supra*, at 5. While this definition borders on the tautological (*i.e.*, it is an individual [or unique] characteristic, if it establishes the object’s uniqueness), for purposes of this section it should simply be recognized that a suspected individual characteristics might not be an individual characteristic at all, but rather a class characteristic. For instance,

A [document] examiner may note an unusual letter formation, which in the experience of that examiner seems to be unique... . But it may be that every schoolchild in a Bulgarian town was taught to execute that particular letter formation. The characteristic may be obscure, but it is still a class

characteristic, not an individual characteristic, and should be given only the weight that a class characteristic deserves and not the additional weight that ordinarily would be given to an individual characteristic.

Thornton & Peterson, supra, at 6.

Individual characteristics, on the other hand, “are marks produced by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced either incidental to manufacture or are caused by use, corrosion, or damage. They are considered unique to that tool and therefore are believed to distinguish it from all other tools.” Alfred Biasotti & John Murdoch, *The Scientific Basis of Firearms and Toolmark Identification*, in 3 *Modern Scientific Evidence* 143 (David L. Faigman et al. Eds 1997) at 206 n.3.

Besides differentiating between class and individual characteristic, firearm examiners must also distinguish between subclass characteristics and individual characteristics. In toolmarks, subclass characteristics emerge when toolmakers mass produce groups of tools which are similar in appearance, size, or surface finish. The toolmarks generated by tools in a given batch have corresponding microscopic characteristics, called subclass characteristics. Subclass characteristics “can be suspected of being found on similarly manufactured tool working surfaces.” *Biasotti & Murdock, supra*, at 212. As a result, the “toolmark examiner must be alert to the possibility that evidence may have been produced by a tool working surface having subclass characteristics.” *Id.* at 210; *see also Green*, 405 F.Supp.2d at 112 n.14 (“The first time an

examiner observes a particular sub-class characteristic, he may assume it is an individual characteristic.”).

The commonness of subclass characteristics leads to the unsettling reality that the manufacturing process creates only a limited number of tools with sufficiently differentiated surfaces which can produce so-called toolmarks with individual characteristics. Furthermore, “as tool manufacturers minimize the steps necessary to produce tools in an effort to become more efficient and economical, the possibility for tools produced with similar characteristics increases.” Stephanie J. Eckerman, *A Study of Consecutively Manufactured Chisels*, 34 Ass’n Firearms & Tool Mark Examiners J. 379, 380 (2002). Moreover, while subclass characteristics may morph into individual characteristics with extended usage, studies have demonstrated that subclass and individual characteristics can appear in tandem with one another, thereby making the identification process even more convoluted. See Jerry Miller, *An Examination of the Application of the Conservative Criteria for Identification of Striated Toolmarks Using Bullets Fired from Ten Consecutively Rifled Barrels*, 31 Ass’n Firearms & Tool Mark Examiners J. 125, 128 (2001) (finding both subclass and individual characteristics on the striated markings on both land and groove impressions of bullets fired by used guns). Consequently, examiners can easily make a false positive identification because “some machining processes are capable of reproducing remarkably similar surface characteristics (i.e., gross contour and/or fine striae, etc.) on the working surfaces of

many consecutively produced tools *which if not recognized and properly evaluated could lead to a false identification.*” *Biasotti & Murdock, supra*, at 17 (emphasis added).

The difficulties posed by mark confusion plays out in troubling ways. In terms of raw numbers, one critic has written:

The significance of these problems is illustrated by findings that up to 25% of the striae in toolmarks made by different screwdrivers of the same brand matched, while the percentage increased to 28% when comparing toolmarks made by different bolt cutters of the same brand. Similarly, in a classic, statistical empirical study in 1955, Alfred A. Biasotti found that 15 to 20% of the striae on bullets fired from different .38 Special Smith & Wesson revolvers matched.

Adina Schwartz, *A Systemic Challenge to the Reliability and Admissibility of Firearms and Toolmark Identification*, 6 Colum. Sci. & Tech. L. Rev. 2 (2005).

As Judge Gertner explained: “There is no question that there are many marks on [toolmarks]... But even assuming that some of these marks are unique to the [tool] in question, the issue is their significance, how the examiner can distinguish one from another, which to discount and which to focus on, how qualified he is to do so, and how reliable his examination is.” *Green*, 405 F.Supp.2d at 110. In addition to identifying the fundamental issue in toolmark examination, Judge Gertner also commented on just how difficult it is for firearms examiners—novice and experienced—to distinguish between class, subclass, and individual characteristics. According to Judge Gertner:

The task of telling them apart is not an easy one: Even if the marks on all of the [tools] are the same, this does not necessarily mean they came from the same [tool]. Similar marks could reflect class or subclass characteristics, which would define large numbers of [tools] manufactured by a given company. Just because the marks on the [tools] are *different* does not mean that they came from *different* [tools]. Repeated [usage], particularly over a

long period of time, could produce different marks as a result of wear or simply by accident.

Green, 405 F.Supp.2d at 107 (emphasis in original). Judge Saris made the some observation in *Monteiro*:

A recent article has highlighted the complexity of comparing patterns because of the difficulty in distinguishing between class, subclass, and individual characteristics, noting that a firearm “may be wrongly identified as the source of a toolmark it did not produce if an examiner confuses subclass characteristics shared by more than one tool with individual characteristics unique to one and only one tool.

Monteiro, 407 F.Supp.2d at 363 (citing Schwartz, *supra*). Reports of testimony from local firearms examiners raise the issue of whether firearms examiners actually understand and can differentiate between individual, class, and subclass characteristics in practice at all.²

The task is made even more problematic because the leading toolmark organization, AFTE, has failed to articulate any standards which could assist fledgling and veteran firearm examiners in distinguishing between these different types of characteristics. Judge Saris highlighted this obstacle in *Monteiro*:

one critical problem with the AFTE Theory [of toolmark identification] is the lack of objective standards for deciding whether a particular mark is a subclass or individual characteristic... Special Agent Curtis added that the

² A media report points to a March 2005 federal trial where a Boston Police Department examiner testified he had no doubt four cartridge cases recovered from a crime scene were fired from a specific Astra pistol in evidence “because they all shared the same similarities, class characteristics.” In a 2000 federal trial, another BDP examiner testified that, as a rule, he declared a match if all he had was a single class characteristic. According to the examiner, “If that was all that I had (a single class characteristic), yes, I would call that a match.” David S. Bernstein, *Bad ballistics: Hundreds of people have gone to prison on the word of Boston’s untrained, unqualified, unskilled firearms examiners*, The Boston Phoenix, Oct. 7-13, 2005.

AFTE Theory offers no guidance on telling the difference between subclass and individual characteristics... there is no generally accepted standard for distinguishing between class, subclass, and individual characteristics.

Monteiro, 407 F.Supp.2d at 371-372.

Finally, notwithstanding the fact that firearm examiners are (and have been) well aware of the dangers and difficulties involved in distinguishing between subclass and individual characteristics, the field, as a whole, has been lethargic at conducting research to minimize these dangers. As Professor Schwartz has highlighted in her article:

Despite their knowledge of this variation,... toolmark examiners have not formulated any generalizations or statistics about which types of tools can be expected to produce toolmarks with subclass or individual characteristics when they are newly manufactured. Nor have they developed statistics or generalizations about the rate(s) at which subclass characteristics on toolmarks produced by various types of tools can be expected to be replaced and/or joined by individual characteristics... toolmark examiners have also failed to develop any rules for distinguishing between subclass and individual characteristics. To avoid confusing subclass characteristics shared by more than one tool with individual characteristics unique to one and only one tool, examiners can only rely on their personal familiarity with types of forming and finishing processes and their reflections in toolmarks.

Schwartz, *supra*, n.1 at 9

In effect, then, “to decide if something could be a sub-class or class characteristic, [a firearm examiner] just compares the image in front of him to what he remembers from all those previous exams.” *Green*, 405 F.Supp.2d at 112; *see also id.* at 108 (“In distinguishing class and sub-class characteristics from individual ones, O’Shea had little upon which to rely. There are reference works that discuss some of the known class and

subclass characteristics but ‘most of the time’ an examiner would be deciding whether a mark was an individual versus sub-class or class characteristic on his own”).

Because this is an empirically testable proposition, *Daubert* and *Kumho Tire* mandate that the Government present empirical research which demonstrates firearm examiners are highly proficient at distinguishing between class, subclass, and individual characteristics. Moreover, the Government’s firearm expert cannot circumvent this requirement by simply making the bald assertion that he can identify a subclass characteristic or individual characteristic when he sees it. *See United States v. Lewis*, 220 F.Supp.2d 548, 553 (D.W.Va. 2002) (Government’s handwriting expert’s “bald assertion that the ‘basic principle of handwriting identification has been proven time and time again through research in [his] field,’ without more specific substance, is inadequate to demonstrate testability and error rate.”). As discussed below, the Government cannot meet that burden.

III. THE GOVERNMENT CANNOT MEET ITS BURDEN THAT TOOLMARKS TESTIMONY IS ADMISSIBLE

As Judge Saris has noted, admission of toolmarks evidence implicates *Daubert*’s and *Kumho Tire*’s “task at hand” requirement. *Daubert*, 509 U.S. at 597; *United States v. Diaz*, 300 F.3d at 73. Put another way, the question is whether the proposed testimony is fits for the premise to be testified to. *Green*, 417 F.Supp.2d at 419. The Supreme Court made this principle clear when it wrote:

Contrary to respondents’ suggestion, the specific issue before the court was not the reasonableness in general of a tire expert’s use of a visual and tactile

inspection... Rather, it was the reasonableness of using such an approach, along with [the expert's] particular method of analyzing the data thereby obtained, to draw a conclusion regarding the particular matter to which the expert testimony was directly relevant... The relevant issue was whether the expert could reliably determine the cause of *this* tire's separation.

Kumho Tire, 529 U.S. at 153-154 (emphasis in original). Consequently, *Kumho Tire* forces the Government to establish proof at both the general level (whether the science is reliable) and a specific level (whether the science fits the goal of making source specific identifications). Both are required; defendant submits that given the shaky state of toolmarks examination "science" the government can establish neither and the testimony must be excluded.

In addition to Judge Saris's searching inquiry in *Monteiro* and Judge Gertner's thoughtful analysis in *Green*, several courts have questioned aspects of toolmarks identification on both the general and specific levels. See *United States v. Willock*, 696 F.Supp.2d 536 (D.Md.2010)(thoroughly describing and limiting firearm identification testimony); *United States v. Taylor*, 663 F.Supp.2d 1170 (D.N.M. 2009)(same); *United States v. Glynn*, 578 F.Supp.2d 567 (S.D.N.Y. 2008)(same); *United States v. Diaz*, 2007 WL 485967(N.D.Cal. 2007)(same); *Sexton v. State*, 93 S.W.3d 96 (Tex. Crim. App. 2002) (rejecting matching of cartridge cases based on magazine marks alone without recovery of underlying magazine). These cases demonstrate that toolmarks identification field lacks firm grounding. As Judge Rakoff observed in *Glynn*, "three federal judges have addressed the scientific status *vel non* of ballistics identification testimony, and all three have concluded that, in one respect or another, it does not have sufficient rigor to be

received as science.” 578 F. Supp. 2d at 571 (*citing Green, Monteiro, and Diaz*). Judge Rakoff in *Glynn* was the fourth federal judge to so conclude. Judge Johnson in New Mexico was the fifth, *see United States v. Taylor*, 663 F.Supp.2d at 1179 (D.N.M. 2009)(quoting the portion of *Glynn* cited above and concluding that “[t]his Court adopts the reasoning of the courts in *Green, Monteiro, Diaz, and Glynn*”) and Judge Quarles of Maryland in *Willock* the sixth. *Willock*, 696 F.Supp.2d at 560. *See also Ramirez v. State*, 810 So. 2d. 836 (Fla. 2001)(“In sum, Hart’s knife mark identification procedure--at this point in time-- cannot be said to carry the imprimatur of science. The procedure is a classic example of the kind of novel ‘scientific’ evidence that *Frye* was intended to banish--i.e., a subjective, untested, unverifiable identification procedure that purports to be infallible.”).

To be sure, no court has yet completely excluded toolmarks evidence from trial. The courts that have found serious deficiencies have nevertheless permitted testimony or comparisons, albeit with sharp limitations. *See, e.g., Glynn*, 578 F. Supp. 2d at 574-575 (firearm examiner would be permitted to testify “only that a firearms match was ‘more likely than not,’ thereby satisfying Rule 401 without overstating the capacity of the methodology to ascertain matches); *Willock*, 696 F.Supp.2d at 547 (firearm expert “not be allowed to opine that it is a ‘practical impossibility’ for any other firearm to have fired the cartridges other than the common ‘unknown firearm’ to which [he] attributes the cartridges” and will “only be permitted to state his opinions and bases without any characterization as to degree of certainty”). But many of those courts placed primary

emphasis, as Judge Saris did in *Monteiro*, on the fact that “toolmark identification evidence has been deemed admissible by many other courts.” *Monteiro*, 407 F.Supp.2d at 364. Most of this case law, however, is terribly outdated, as it was premised on *Frye*’s general acceptance standard; a standard which the Supreme Court held was superseded by Rule 702. *See Daubert*, 509 U.S. at 587-590. Thus, the fact that various courts accepted toolmark or firearm evidence under *Frye*’s general acceptance standard has no bearing on this Court’s reliability analysis under Rules 702 and 403. *See United States v. Prim*, 363 F.3d 1028, 1033 (9th Cir. 2004)(“In accordance with *Kumho Tire*, the broad discretion and flexibility given to trial judges to determine how and to what degree [the *Daubert*] factors should be used to evaluate the reliability of expert testimony dictate a case-by-case review rather than a general pronouncement that in this Circuit [a well-accepted technique] is reliable. As the Supreme Court concluded, we can neither rule out, nor rule in, for all cases and for all time the applicability of the factors mentioned in *Daubert*, nor can we now do so for subsets of cases categorized by category of expert or by kind of evidence. Too much depends upon the particular circumstances of the particular case at issue.”); *Ramirez v. State*, 542 So.2d 352, 355 (1989) (We reject the state’s argument that, since the Supreme Court of Kansas... admitted testimony that a particular knife caused the wound, without a predicate of scientific reliability, we should do likewise.”). *See also United States v. Santillan*, 1999 WL 1201765 at p. 4 (N.D. Cal. 1999) (“The government is correct in their assertion that pre-*Daubert/Kumho*/ Ninth Circuit precedent supports the admissibility of (handwriting) testimony; however, the world has changed.

The Court believes that . . . a past history of admissibility does not relieve this Court of the responsibility of now conducting *Daubert/Kumho* analysis as to this proffered expert testimony.”); *United States v. Hines*, 55 F.Supp. 62, 67 (D. Mass. 1999) (“The Court is plainly inviting a reexamination even of ‘generally accepted’ venerable, technical fields.”). Indeed, in *Glynn*, 578 F. Supp. at 569, the Court placed severe limitations on the admissibility of firearm testimony, despite its acknowledgment that “for many decades ballistics testimony was accepted almost without question in most federal courts in the United States.” In short, toolmark evidence is so subjective as to make it inherently unreliable and the time has come for courts to completely bar, rather than just limit, the opinion testimony that comes from it.

As Judge Saris aptly predicted, and the drumbeat of these cases and the NAS report makes clear, “[s]torm clouds... are gathering” over toolmark and firearms identifications because they are “based primarily on a visual inspection of patterns of toolmarks, and is largely a subjective determination based on experience and expertise.” *Monteiro*, 407 F.Supp.2d at 355. *See also Willock*, 696 F.Supp.2d at 560 (“The subjective evaluation leaves substantial latitude in reaching conclusions. Indeed, the AFTE's most ardent supporter, Ronald Nichols of the ...[ATF] ... acknowledges the subjective component of toolmark examiners undertaking to discern ‘sufficient agreement’ in a toolmark identification, stating that ‘there is no universal agreement as to how much correspondence exceeds the best-known nonmatching situation.’”); *Taylor*,

663 F.Supp.2d at 1178 (“Even the Government concedes that ‘the field continues to rely on a subjective match standard.’ ”). The reasons for judicial consternation are numerous:

There is continuing confusion in the toolmark field regarding class, subclass, and individual characteristics: *Taylor*, 663 F.Supp.2d at 1178 (extremely difficult to “distinguish[] between class, subclass, and individual characteristics”); *Monteiro*, 407 F.Supp.2d at 363 (“a firearm ‘may be wrongly identified as the source of a toolmark it did not produce if an examiner confuses subclass characteristics shared by more than one tool with individual characteristics unique to one and only one tool.’” (citation omitted)).

There is necessarily a pro-prosecution bias in the field: *Green*, 405 F.Supp.2d at 109 n.7 (bias can and does affect the reliability of firearms examinations because the “‘field’ consists entirely of individuals who work for law enforcement agencies”). *See also Melendez-Diaz v. Massachusetts*, 557 U.S. 305, 317 (2009)(acknowledging the 2009 NAS Report’s discussion of “problems of subjectivity, bias, and unreliability of common forensic tests such as...toolmark and firearms analysis.”).

There is a lack of educational Standards and no mandatory accreditation or certification: *Monteiro*, 407 F.Supp.2d at 373 (the foremost forensic accrediting organization, the American Society of Crime Laboratory Directors [ASCLD/LAB], “lists a bachelor’s degree with science courses as a ‘desirable’ qualification for firearm [and toolmark] examiners, it does not list it as ‘essential’”)(citing ASCLD/LAB *Laboratory Accreditation Board Manual*, 29 (1997)); cf. *Williamson v. Reynolds*, 904 F.Supp. 1529, 1559 (E.D.Okla. 1995)(in excluding hair identification for failure to satisfy *Daubert*, key

fact was that “hair experts [were] generally technicians testifying for the prosecution, not scientists who [could] objectively evaluate such evidence.”).

There is no ascertainable error rate: *Monteiro*, 407 F.Supp.2d at 367 (citation omitted); *see also Diaz*, 2007 WL 485967 at *9 (“No true error rate will ever be calculated so long as the firearm-examiner community continues to rely on the subjective traditional pattern matching method of identification.”).

No validated standards for declaring a match exist: *Green*, 405 F.Supp.2d at 114, 121 (“there are no national standards to be applied to evaluate how many marks must match;” thus reproducibility, “an essential component of scientific reliability,” lacking); *see also Taylor*, 663 F.Supp.2d at 1177 (“The AFTE Theory, thus, does not provide any uniform numerical standard examiners can use to determine whether or not there is a match and, indeed, Mr. Nichols indicated in his testimony that most AFT examiners do not use any numerical standard. Instead, the AFTE theory is circular.”); *Glynn*, 578 F.Supp2d at 574 (“[B]allistics comparison lacks defining standards to a degree that exceeds most other kinds of forensic expertise. For example, whereas both a ballistics examiner and a fingerprint examiner are ultimately called upon to make a subjective judgment of whether the agreement between two pieces of evidence is “sufficient” to constitute a “match,” a fingerprint examiner may not declare a match unless a pre-specified number of “points” of similarity exist between the two samples....Although attempts been made to introduce similar minimum standards and ‘protocols’ into ballistics analysis, such attempts have not yet met with general

acceptance..."); *Monteiro*, 407 F.Supp.2d at 371-372 ("one critical problem with the AFTE Theory [of toolmark identification] is the lack of objective standards for deciding whether a particular mark is a subclass or individual characteristic... the AFTE Theory offers no guidance on telling the difference between subclass and individual characteristics... there is no generally accepted standard for distinguishing between class, subclass, and individual characteristics.").

Procedures employed in the field exacerbate observer bias. *See Green*, 405 F.Supp.2d at at 131; (discussing dangers of evidentiary "show-up" procedure); *Taylor*, 663 F.Supp.2d at 1178-79 ("Generally, as was done in this case, the examiner is handed only one suspect weapon and the recovered projectile or projectiles...The problem with this practice is the same kind of problem that has troubled courts with respect to show-up identifications of people: it creates a potentially significant 'observer effect' whereby the examiner knows that he is testing a suspect weapon and may be predisposed to find a match.").

The field suffers from a dearth of empirical testing. *See Green*, 405 F.Supp.2d at 118-119 (where toolmarks field aspires to be scientific, "[t]here is no reason why these premises and observations cannot be tested under the *Daubert-Kumho* standards"); *Monteiro*, 407 F.Supp.2d at 364 (Daubert challenges "represent the biggest challenge facing the firearms discipline since it was firmly established in the 1920's.").

Two National Academy of Sciences studies vindicated the judicial unease voiced in regard to each of these failings. The NAS 2009 report authoritatively documented and

elaborated on all of these failings. The report was damning in its criticism of fields, like toolmarks, with pretensions to scientific validity: “many forensic tests- such as those used to infer the source of toolmarks . . . have never been exposed to stringent scientific scrutiny,” “the scientific knowledge base for toolmark and firearm analysis is fairly limited,” and “[e]ven with more training and experience using new techniques, the decision of the toolmark examiner remains a subjective decision based on unarticulated standards and no statistical foundation for estimation of error rates.” NAS Report, p. 42, 153-154. Criticisms of the method that firearms and toolmark examiners use for reaching identification conclusions were also advanced in the National Academy of Science’s *Report of the National Research Council Committee to Assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database, Ballistics: Ballistics Imaging* (2008) at 82 (“Conclusions drawn in firearms identification should not be made to imply the presence of a firm statistical basis when none has been demonstrated.”); *id.* (criticizing firearms and toolmark examiners’ absolute identification conclusions for “cloak[ing] an inherently subjective assessment of match with an extreme probability statement that has no firm grounding and unrealistically implies an error rate of zero”).

The most worrisome criticism is that toolmark identification is highly subjective, a fact which both the science community and courts have decried. NAS 2009 Report at 153-154 (“[T]he decision of the toolmark examiner remains a subjective decision based on unarticulated standards and no statistical foundation for estimation of error rates.”); *Id.* at 155 (“A fundamental problem with toolmark and firearms analysis is the lack of a

precisely defined process [for reaching identifications]."); *Taylor*, 663 F.Supp.2d at 1178 ("Even the Government concedes that 'the field continues to rely on a subjective match standard.'"); *Glynn*, 578 F. Supp. 2d at 572 ("[B]allistics opinions are significantly subjective. Moreover, the standard defining when an examiner should declare a match--namely, 'sufficient agreement'--is inherently vague."); *Ramirez*, 810 So.2d at 847.

The NAS 2009 Report brought this troubling truth into focus, noting that "[w]ith the exception of nuclear DNA analysis...no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source." NAS (2009) at p. 7.

The Report applied these criticisms to firearms and toolmark identification:

Toolmark and firearms analysis suffers from the same limitations [as other types of] impression evidence. Because not enough is known about the variabilities among individual tools and guns, we are not able to specify how many points of similarity are necessary for a given level of confidence in the result. Sufficient studies have not been done to understand the reliability and repeatability of the methods. ...

A fundamental problem with toolmark and firearms analysis is the lack of a precisely defined process [for reaching identification conclusions]. ...

... Overall, the process for toolmark and firearms comparison lacks the specificity of the protocols for, say, 13 STR DNA analysis. This is not to say that toolmark analysis needs to be as objective as DNA analysis in order to provide value. ... But the protocols for DNA analysis do represent a precisely specified, and scientifically justified, series of steps that lead to results with well-characterized confidence limits, and that is the goal for all the methods of forensic science.

Id. at 154-155.

The cited district court opinions completely barring or limiting highly subjective forensic identification evidence under Daubert have repeatedly premised exclusion (at least in part) on the fact that these forensic fields did not have any objective standards. And they did so before the NAS issued its seminal report identifying practices bereft of scientific merit. Because of the complete lack of objective standards in the toolmarks field, this Court should do no different.

None of the courts that have found serious deficiencies in the scientific pretension of toolmarks testimony, and none of the courts that admitted testimony just because it had always been admitted, had the benefit of the NAS 2009 National Research Council study discussed above. That study underscores the necessity of a more critical analysis in admission of testimony with faulty underpinnings, a critical analysis even more necessary where a life hangs in the balance. *See United States v. Taveras*, 424 F. Supp. 2d 446, 462 (E.D.N.Y. 2006) (Weinstein, J.) (“Federal courts bear responsibility for ensuring that trials before them are conducted in conformity with statutory imperatives and the fairness required by the Fifth, Sixth, and Fourteenth Amendments. Because of heightened need for reliability in capital sentencing, the court should be exceptionally careful when considering whether to admit or exclude evidence...”); *Green*, 405 F.Supp.2d at 109 (when liberty hangs in the balance—and, in the case of the defendants facing the death penalty, life itself—the standards should be higher than were met in this case, and than have been imposed across the country.”). This Court should conduct that critical

analysis and determine that toolmarks testimony is inadmissible under *Daubert* and Rule 702.

IV. TESTIMONY REGARDING INCONCLUSIVE CLASS CHARACTERISTICS MUST BE EXCLUDED OUTRIGHT

Rule 702 requires that the evidence or testimony “assist the trier of fact to understand the evidence or to determine a fact in issue.” Fed. R. Evid. 702. Expert testimony must logically advance a material aspect of the case and be sufficiently tied to aspect so that it will assist the jury to sort out contested issues. *United States v. Mehanna*, 735 F.3d 32, 66-67 (1st Cir. 2013). In other words, expert testimony is inadmissible if it is irrelevant and unhelpful to the jury. Fed. R. Evid. 401, 702.

Here, the government seeks to have Trooper Cahill testify that three projectiles, Items 61-1, 61-3, and 61-5, were comparable at the most general level of sharing Class Characteristics, in essence identifying the cartridge as an M&M rather than a gumball. *See* Part II, *supra*; *Monteiro*, 407 F.Supp.2d at 360 (“Class characteristics are defined as ‘family resemblances which will be present in all weapons of the same make and model.’”) Opinion testimony at a class level is only a marginal improvement from “inconclusive.” Such a result cannot be helpful to the jury, as it does not logically advance a material aspect of the case and is not sufficiently tied to the facts of the case that it will aid the jury in resolving a factual dispute. The testimony regarding these three projectiles must therefore be excluded. Fed. R. Evid. 401, 403, 702.

V. AN EVIDENTIARY HEARING IS REQUIRED

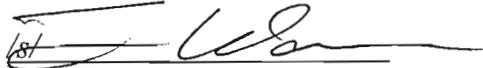
The changes engendered by *Daubert* and the amendment of Rule 702 have required reexamination of many long-held practices in trials courts; toolmarks examination is one of the most prominent examples. Although “for many decades ballistics testimony was accepted almost without question in most federal courts in the United States,” “like many other forms of expert testimony, this practice [is now] subject to new scrutiny in light of *Daubert* and *Kumho Tire* and the subsequent amendment to Federal Rule of Evidence 702, which gave to the courts a more significant gatekeeper role with respect to the admissibility of scientific and technical evidence than courts previously had played.” *Glynn*, 578 F.Supp.2d at 569-570; see *Green*, 405 F.Supp.2d at 118 (“*Daubert* plainly raised the standard for existing, established fields, inviting a reexamination even of ‘generally accepted’ venerable, technical fields. [and] [r]efusing to do so would be equivalent to grandfathering old irrationality)(internal citations and quotations omitted). *Monteiro*, 407 F.Supp.2d at 357 (collecting judicial and scientific criticism). Where, as here, a life may hang in the balance, this Court must vindicate the need for heightened reliability and confidence in the evidence presented to the jury. Where the issues of testability, peer review, error rate, standards, subjectivity and general acceptance are all, to varying degrees, in firm as to toolmarks identification opinions, the Court should hold an evidentiary hearing to resolve this motion.

CONCLUSION

Daubert and Rule 702 mandate that this Court conduct a searching inquiry of any proposed expert testimony to ensure it is not only relevant but reliable. This inquiry, according to *Daubert*, should focus on such issues as testability, peer review, error rate, standards, and general acceptance. The defendant has offered a more than sufficient basis to demonstrate that toolmarks evidence does not satisfy any of these reliability factors. As a result, toolmark identification evidence is inherently unreliable and inadmissible under *Daubert*. Moreover, due to its unreliability, and the lack of any acceptable methodology, it is also inadmissible under Rule 702. The testimony and evidence must therefore be excluded.

Respectfully submitted,

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I hereby certify that this document was served on counsel for the government by email and paper copy by interoffice delivery on December 5, 2014.



Timothy Watkins